

A REVIEW OF THE WEST INDIAN "CHORANTHUS"

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INTRODUCTION

WHEN HARRY K. CLENCH asked me to identify a single hesperiine skipper in connection with his forthcoming paper on Bahaman butterflies it looked like a rather simple, straightforward task. The job became more difficult when the specimen was a female of an undescribed *Choranthus*, apparently the one mentioned by Rindge (1955). It was necessary to examine the female genitalia of all *Choranthus* to correctly place the new species, and it became evident that the genus as defined by Evans (1955) was not a homogeneous assemblage of skippers. Accordingly, the male genitalia of all "*Choranthus*" were examined, as were the terminalia of both sexes of representative *Poanes* and *Paratrytone*, and comparisons were made.

The paper which follows reflects the conclusions reached in this study. One species of "*Choranthus*" is placed in *Paratrytone*, another is the type of a new genus and the genus *Choranthus*, s. s., is divided into two species groups.

SYSTEMATIC REVISION

Since Evans' (1955) key to *Choranthus* is inadequate and contains some fundamental errors, new keys will be provided throughout this paper.

A Key to the Genera of "*Choranthus*"

1. Third segment of palpus very short, barely protruding beyond the hairs of the second; gnathoi narrow, free and about as long as uncus; valva broad and distally rounded *Paratrytone* Godman.
- 1¹. Third segment of palpus prominent and protruding well beyond the hairs of the second; gnathoi fused and developed into a spatulate structure, or if not, the valva is pointed. 2.
2. Gnathoi fused into a spatulate structure; median projections of lamella antevaginalis prominent; larger skippers (forewing length at least 14 mm.) *Choranthus* Scudder.
- 2¹. Gnathoi free and pointed; lamella antevaginalis simple; small skippers (forewing length about 10 mm.) *Parachoranthus*, n. gen.

Genus **PARATRYTONE** Godman, 1900

Paratrytone Godman, 1900. Biol. Cent.-Amer., Rhop. 2: 487. Type-species:

Paratrytone rhexenor Godman, by original designation.

Antenna not quite half as long as forewing costa; club occupying the distal quarter of the shaft and bent beyond its thickest point to a tapering apiculus; nudum variously 4/8, 5/7 and 5/8. Palpus semi-porrect; third segment short, barely protruding beyond hairs of the second. Midtibia armed with a pair of well to moderately well-developed terminal spurs; hindtibia with two pairs of well-developed spurs. Wing venation as in other members of the *Poanes-Atrytone* generic complex; forewing stigma, when present, bipartite, the posterior member extending from about the middle of 2A to just below the origin of Cu₂, and the anterior member extending from just above and distad of the origin of Cu₂ to just below and distad of the origin of Cu₁. The male genitalia are characteristic: the uncus is long, slender and undivided; the gnathoi are nearly as long as the uncus, narrow and free; the valvae are broad and distally rounded and the penis is enlarged distad and adorned with prominent cornuti. The female genitalia lack the median posteriad projections of the lamella antevaginalis characteristic of *Choranthus* and more nearly resemble those of *Poanes* Scudder.

This genus is very close to *Poanes* and was formerly combined with it (see Lindsey, 1921: 84-88). The two genera differ chiefly in the shorter, more abrupt antennal club of *Paratrytone* and in the form of the male genitalia. Nine Nearctic and Neotropical skippers are referred to this genus by Evans (1955: 349-352), and one West Indian species which he places in *Choranthus* belongs here.

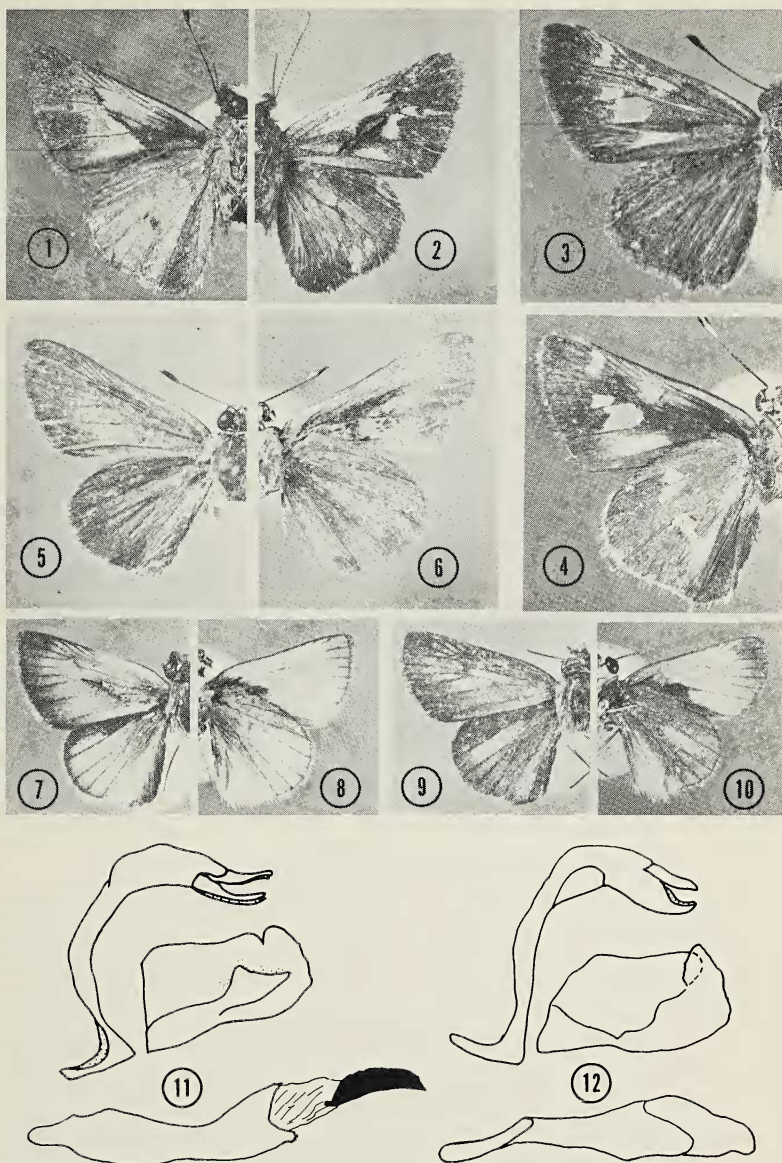
Paratrytone batesi (Bell), 1935

Figs. 1, 2 (♂), 3, 4 (♀), 11 (♂ gen.), 19 (♀ gen.)

Poanes batesi Bell, 1935. Psyche, 42: 63 (La Selle Mtns., Haiti).

In his detailed original description Bell correctly associated this species with the *polyclea* Godman-*aphractoia* Dyar section of *Paratrytone* (which he considered synonymous with *Poanes*), but Evans (1955: 354) placed *batesi* in *Choranthus* with the other West Indian members of the *Poanes* complex. From members of *Choranthus* the present species may be readily distinguished by the short terminal segment of the palpus and by the configurations of both the male and female genitalia. For comparison I have also figured the genitalia of both sexes of *Paratrytone rhexenor* in figs. 12 (♂) and 20 (♀). Inasmuch as *batesi* has not been figured previously, I here figure two paratypes.

This species has thus far been reported only from the mountains of Hispaniola at elevations of 5000 to 7400 feet in the pine forest or at the edge of the cloud forest (Bell, 1935: 67).



1. *Paratrytone batesi* (Bell), ♂ paratype, under surface; La Selle Mtns., HAITI. 2. Same, upper surface. 3. *P. batesi*, ♀ paratype, upper surface; La Selle Mtns., HAITI. 4. Same, under surface. 5. *Choranthus richmondi*, new species, ♀ holotype; White Point, Great Guana Cay, Exuma Islands, BAHAMAS. Note that this specimen has a hole in the forewing below the origin of Cu_2 and above $2A$. 6. Same, under surface. 7. *Parachoranthus magdalia* (Herrich-Schaffer), ♂, upper surface; Santiago, CUBA. 8. Same, under surface. 9. *P. magdalia*, ♀, upper surface; Cristo, Oriente, CUBA. 10. Same, under surface. 11. *Paratrytone batesi* (Bell), ♂ genitalia. 12. *Paratrytone rhexenor* Godman, ♂ genitalia.

Genus **CHORANTHUS** Scudder, 1872

Choranthus Scudder, 1872. Rept. Peabody Acad. Sci., 1871: 79. Type-species: *Hesperia radians* Lucas, by original designation.

Antenna approximately half the length of forewing costa; club occupying the distal quarter of the shaft and bent abruptly beyond its thickest point to a tapering apiculus one-third as long as the club, nudum 4/8 (*radians* group); or tapering more gently to an apiculus half as long as the club, nudum 5/8 (*lilliae* group). Palpus semi-porrect; third segment moderately long, extending well beyond the hairs of the second. Midtibia armed with well-to moderately well-developed terminal spurs (never smooth, as stated by Evans, 1955: 352); hindtibia with two pairs of spurs. Wing venation and stigma about as in *Paratrytone*, but stigma absent in *vitellius* (Fabricius). Male genitalia with the gnathoi fused into a broad spatulate structure, most prominent in the *radians* group, and a shorter, heavier uncus than in *Paratrytone*, particularly in the *lilliae* group. The female genitalia are characterized by median posteriad projections of the lamella antevaginalis, best shown in the *radians* group, and by the shield-like lamella postvaginalis.

Choranthus is an endemic West Indian genus and is the chief representative of the *Poanes* complex in that area. Many authors (e. g., Lindsey, Bell and Williams, 1931: 108-113) have considered *Choranthus* a synonym of *Poanes*, but more recent writers have considered the genera to be separate. The form of both the male and female genitalia will serve to separate *Choranthus* from the basically continental members of the *Poanes* complex. Evans (1955: 352-254) includes seven species in the present genus. Two of those species are here removed, and one new one is described, so six species remain in the genus. These species are further separated into two species groups, of which the *radians* group is considered the more advanced on the basis of the more elaborate development of the gnathoi and the more highly developed median projections of the lamella antevaginalis.

A Key to the Species of *Choranthus* Scudder

1. Antennal club gently tapering to an apiculus half as long as the club, nudum 5/8; uncus very short (see figs. 16, 17); large insects (forewing length greater than 17 mm.) *lilliae* group, 2.
- 1¹. Antennal club abruptly ending in an apiculus one-third as long as club, nudum 4/8; uncus longer (see figs. 13-15); smaller insects (forewing length less than 17 mm.) *radians* group, 3.
2. ♂ above with complete dark forewing extradiscal band; ♀ above with extensive fulvous forewing markings; Jamaica. *lilliae* Bell.
- 2¹. ♂ above with an incomplete dark forewing extradiscal band; ♀ above with restricted fulvous and cream-colored markings on the forewing; Puerto Rico. *borincona* (Watson).
3. ♂ with no stigma; ♀ above bright yellowish-fulvous; Puerto Rico. *vitellius* (Fabricius).
- 3¹. ♂ with a stigma; ♀ above either fuscous, or if fulvous, a dark, reddish-fulvous. 4.
4. ♂ ♀ hindwing below fuscous with prominent paler veins; Cuba and Florida. *radians* (Lucas).
- 4¹. ♂ ♀ below without prominent paler veins. 5.

5. ♂ ♀ hindwing below light fulvous-gray except for bright fulvous anal fold; Hispaniola and Florida. *haitensis* Skinner.
 51. ♂ unknown; ♀ hindwing below heavily overscaled with green except anal fold which is bright fulvous; Bahamas. *richmondi*, n. sp.

the *LILLIAE* group

These are larger skippers (forewing length 17-19 mm.) than members of the *radians* group. They are further characterized by the form of both the male and female genitalia and by the more tapered antennal club with a longer apiculus. Two species are recognized, one from Jamaica and the other from Puerto Rico.

Choranthus lilliae Bell, 1931

Figs. 17 (♂ gen.), 26 (♀ gen.)

Choranthus lilliae Bell, 1931. Ent. News 42: 220 (Bath, St. Thomas Parish, Jamaica).

Males of the present species may be distinguished from those of *borincona*, the only other large *Choranthus*, by the complete dark extradiscal band on the upper surface of the forewing. The females are dark, like those of *borincona*, but the forewings are strongly flushed with fulvous on the upper surface in *lilliae*, and the forewing markings are more diffuse. The gnathoi are less well-developed than those of *borincona*, and the penis is only slightly longer than the valvae. The female genitalia differ from those of *borincona* as shown in our figures; the development of the lamella antevaginalis is most aberrant in *lilliae*. Both sexes of this attractive skipper have been figured by Avinoff and Shoumatoff (1941).

All the specimens of *lilliae* that have come to my attention have been taken at, or very near, the type-locality.

Choranthus borincona (Watson), 1937

Figs. 16 (♂ gen.), 25 (♀ gen.)

Godmania borincona Watson, 1937. American Mus. Novitates, (906): 9 (Adjuntas, Puerto Rico).

The males of this species may be readily separated from those of *lilliae* by the incomplete dark extradiscal band on the forewing above, whereas the females are characterized by the restricted fulvous of the upper surface and the tendency for the forewing spots to be cream-colored. The valvae are quite different from those of other *Choranthus*, but the typical development of the gnathoi indicates the correct position of this skipper. The male is figured by Comstock (1944), and the female by Dewitz (1877), as *silus*).

Borincona is known only from Puerto Rico; all the specimens I have seen are from lower elevations. It does not appear to be common.

the **RADIANS** group

These are smaller skippers (forewing length 14-17 mm.) than those of the *lilliae* group. The male and female genitalia are distinctive, and the antennal club ends more abruptly in a shorter apiculus, as indicated in the generic description. Four species are included, one each from Puerto Rico, Hispaniola, Cuba and the Bahamas, and two of these species have been taken in Florida.

Choranthus radians (Lucas), 1857

Figs. 13 (♂ gen.), 22 (♀ gen.)

Hesperia radians Lucas, 1857. Sagra's Hist. Cuba, 7: 650 (Cuba).

= *Hesperia ammonia* Plotz, 1883. Stettiner Ent. Zeitg., 44: 201 (no locality cited, presumably Cuba).

= *Hesperia magica* Plotz, 1883. Stettiner Ent. Zeitg., 44: 202 (Cuba).

= *Pamphila streckeri* Skinner, 1893. Ent. News, 4: 211 (Florida).

= *Choranthus radians* f. *bellus* Draudt, 1924. in A. Seitz, Macrolepid. World, 5: 941; pl. 182h (Cuba).

The females, and to a lesser extent the males, of this species are polymorphic, but I can detect no differences in either the male or female genitalia which correlate with the superficial ones. Draudt (1924: 941) recognized three forms, and Evans

1955: 353) two, but all the material is best referred to *radians* with no further qualification. The very highly developed gnathoi will distinguish the males of this species from those of all other *Choranthus*, and the shield-shaped lamella postvaginalis, while not so broad as in the next species, is broader than those of *haitensis* or *vitellius*. Superficially this species may be separated from all others by the pale veins on the under surface of the hindwing. *Radians* has been figured by Draudt (1924), Holland (1931), Klots (1951) and particularly well by Williams (1931).

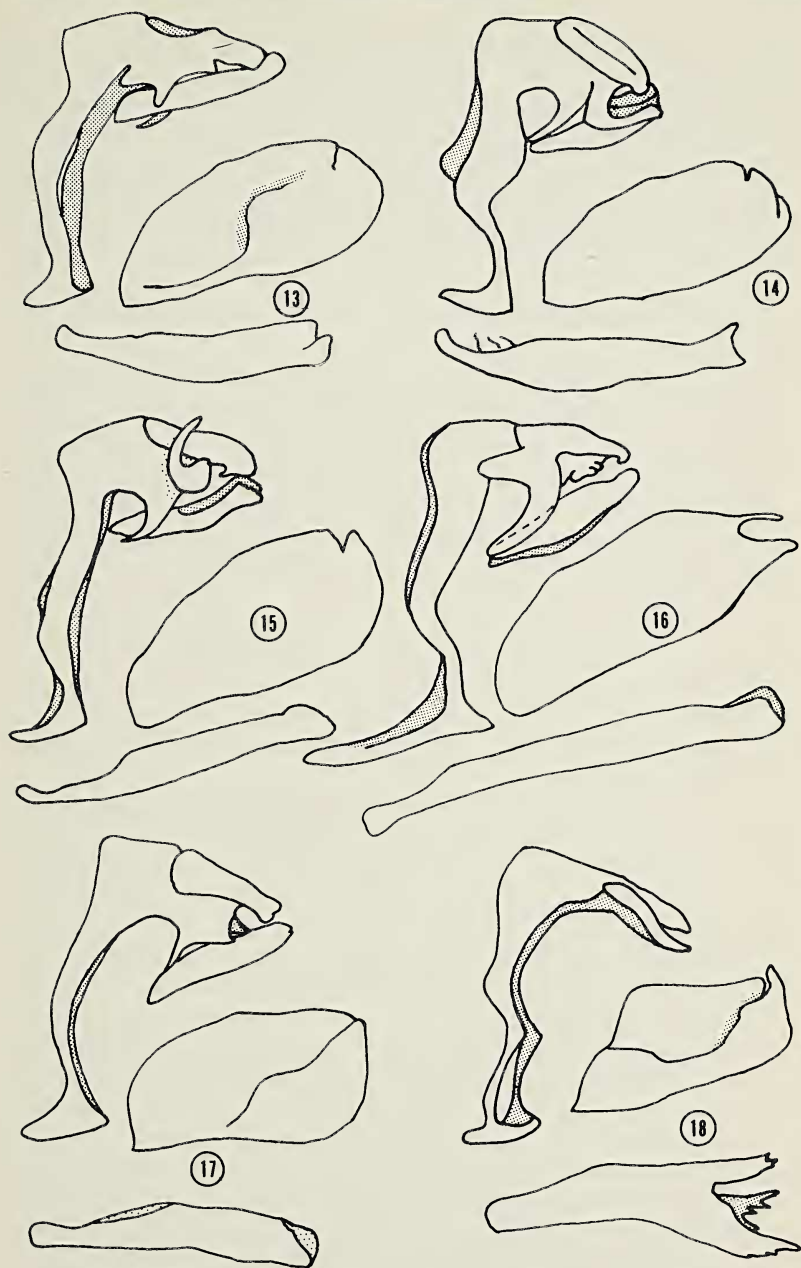
This species is apparently abundant throughout Cuba and has been reported from Florida. It may be an occasional introduction into the United States, not a resident butterfly (Klots, 1951: 251-252).

Choranthus richmondi, new species

Figs. 5, 6 (♀), 21 (♀ gen.)

Female: Head, thorax and abdomen blackish-brown above sprinkled with greenish and fulvous hairs, heaviest on the head and patagia. Antenna dark brown above, fulvous at the base of the club; below the shaft is ringed with alternating chocolate-brown and light fulvous; nudum dull brown. Palpus brownish-black above and pale fulvous below; cheeks light grayish-fulvous. Thorax and abdomen beneath densely covered with tan hairs intermingled with a few green ones. Legs thickly covered with bright fulvous hairs.

Upper surface of forewing dark fuscous with a darker patch near the end of the cell corresponding to that of other members of the group. The area bounding the cell, from the origin of R₁, around the cell and thence



Figs. 13-18: ♂ genitalia of "Choranthus". 13. *Choranthus radians* (Lucas). 14. *C. haitiensis* Skinner. 15. *C. vitellius* (Fabricius). 16. *C. borincona* (Watson). 17. *C. lilliae* (Bell). 18. *Parachoranthus magdalia* (Herrich-Schaffer).

across the wing to near the middle of 2A, is thinly dusted with fulvous scales and corresponds to the light patch on females of other *radians* group skippers. The hindwing is also dark fuscous with long basal fulvous hairs and a poorly defined discal patch of the same color interrupted by darker veins. The fringes of both wings are grayish-brown.

Under surface of forewing fuscous, darker from the base to the end of the cell and almost to the inner margin. Costa heavily overscaled with bright fulvous; the apex, margin and extradiscal areas are thickly overscaled with mixed fulvous and green. Hindwing likewise fuscous heavily dusted with mixed fulvous and green scales, fulvous alone in the anal area. There are no discal markings, and the veins are not paler than the ground color.

Length of forewing of Holotype ♀, 15.5 mm.; of Paratype ♀, 16.5 mm.

The female genitalia are characteristic of the *radians* group as regards the paired median posteriad projections of the lamella antevaginalis. The broad, shield-like lamella postvaginalis is similar to that of *radians*, but it is broader in the present species.

Described from two females from the Exuma Islands, Bahamas.

HOLOTYPE ♀: White Point, Great Guana Cay, Exuma Islands, BAHAMAS; 17.vii.1965 (N. D. Richmond); ♀ genitalia slide no. M-1458 (Lee D Miller).

PARATYPE ♀: Exuma Cays, Bitter Guana Cay, BAHAMAS; 13.i.1953 (L. Giavannoli); ♀ genitalia slide no. G2410 (American Museum of Natural History).

The Holotype is in the collection of Carnegie Museum (C. M. Ent. type series no. 513), and the Paratype is in the collection of the American Museum of Natural History.

I take great pleasure in naming this skipper for my friend and colleague, Neil D. Richmond, Curator of Amphibians and Reptiles, Carnegie Museum, who collected the Holotype. His collections have enriched the entomological holdings of Carnegie Museum for many years.

This species is the "*Choranthus* species" referred to by Rindge (1955) in his report of the Bahaman butterflies. The specimen he noted is the Paratype.

C. richmondi is closest to *radians*, and probably *radians* was the ancestral species of the Bahaman insect. The Exuma Islands are those nearest eastern Cuba and lie along the "main line" of dispersal from Cuba to the remainder of the Bahamas. From the systematic proximity of *radians* and *richmondi*, I expect the male of the latter to be rather like that of *radians*, perhaps darker, and with at least some green overscaling on the hindwing beneath. I doubt that the conspicuously paler veins of the hindwing below which identify *radians* will be apparent in the present species.

Choranthus haitensis Skinner, 1920

Figs. 14 (♂ gen.), 23 (♀ gen.)

Choranthus haitensis Skinner, 1920. Ent. News, 31: 187 (Haiti).

On the upper surface this species resembles *radians*, but the under surface of the hindwing is light fulvous-gray with no trace of the paler veins which distinguish *radians*. The gnathoi are not as well-developed into the distinctive spatulate structure as they are in *radians*, and the median posteriad projections of the lamella antevaginalis are not as prominent as in either *radians* or *richmondi*. This butterfly is figured by Comstock (1944).

C. haitensis has been reported from Hispaniola, Florida and Puerto Rico, though Comstock (1944: 563) expressed some doubt as to its occurrence in Puerto Rico. The specimens from other than Hispaniola undoubtedly are strays, and since this species has been recently and authentically reported from Florida (see Klots, 1951: 251-252) its occurrence in Puerto Rico as an occasional windblown stray is not unexpected. Furthermore *haitensis* should be sought in Cuba, though I have seen no records from that island to date.

Choranthus vitellius (Fabricius), 1793

Figs. 15 (♂ gen.), 24 (♀ gen.)

Hesperia vitellius Fabricius, 1793. Ent. Syst.: 327 ("American meridionalis Insulis").= *Hesperia huebneri* Plotz, 1883. Stettiner Ent. Zeitg., 44: 199 (West Indies").= *Pamphila insularis* Mabille, 1891. C.-R. Soc. Ent. Belgique, 35: 174 (St. Thomas, Virgin Islands).= *Pamphila portensis* Mabille, 1891. C.-R. Soc. Ent. Belgique, 35: 184 (Puerto Rico).= *Adopaea commodus* Kirby, 1903. Samml. exot. Schmett., Neue englische facsimile ausgabe, 3: 110 (replacement name for *vitellius* Hubner, wrongly believed to be different from *vitellius* Fabricius).

This species is the only *Choranthus* which lacks the prominent, bipartite forewing stigma, thus serving to distinguish the males. The females are much more ochreous on the upper surface than are those of other species in the genus. The male and female genitalia are quite distinctive, as may be seen in the figures. Comstock (1944) figures this skipper.

Vitellius is abundant in Puerto Rico and the Virgin Islands, apparently flying throughout the year. Evans (1955: 353) also records specimens from Guatemala, Florida and the Amazon, all of which are probably based on mislabelled specimens. At best any of these records could represent strays, not permanent members of the faunas of these countries.

Genus PARACHORANTHUS, new genus

Type-species: *Hesperia magdalia* Herrich-Schaffer, 1863.

Antenna about two-fifths the length of the forewing costa; club occupying the distal third of antenna and tapering gradually beyond its thickest point to an apiculus which is half as long as the club; nudum 6/6. Palpus semi-porrect, third segment fairly long and extending well beyond the hairs of the second. Midtibia armed with a pair of well-developed, terminal spurs (not three, as claimed by Evans, 1955: 352); hindtibia with two pairs of spurs. Wing venation and placement of stigma as in other members of the *Poanes* complex; forewing more rounded than in other "*Choranthus*", and the stigma is thinner and less prominent. The male genitalia show affinities to both the *Poanes* complex and to *Polites* (especially *vibex*) and almost no similarity to those of *Choranthus*, particularly as regards the long, narrow uncinal structures, the pointed valvae and the heavily armed penis. The female genitalia are not as massive as those of other West Indian *Poanes* group skippers, and again the female terminalia resemble those of some *Polites*.

One species is included in this genus.

***Parachoranthus magdalia* Herrich-Schaffer), 1863**

Figs. 7, 8 (♂), 9, 10 (♀), 18 (♂ gen.), 27 (♀ gen.)

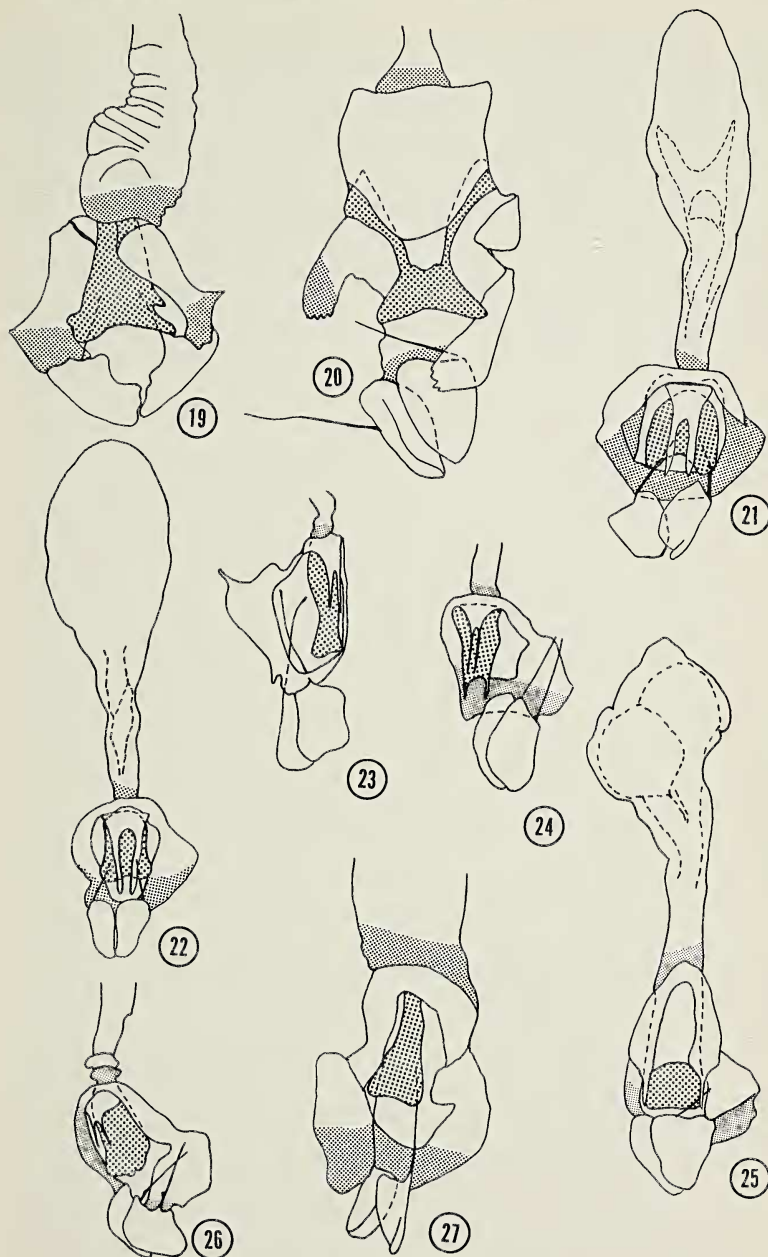
Hesperia magdalia Herrich-Schaffer, 1863. Corresp.-blatt Zool.-Min. Verein in Regensburg, 17: 143 (Cuba).

This species may readily be distinguished from all other "*Choranthus*" by its small size (forewing length seldom exceeds 10 mm.), its more rounded wings and by the configurations of both the male and female genitalia. Since I have seen no adequate figures of this skipper, I am figuring a pair from Oriente, Cuba.

This skipper is thus far known only from Cuba, and all the specimens I have seen are from the eastern part of the island. Apparently *magdalia* is abundant where it is found (Williams, 1931: 313).

**GEOGRAPHIC DISTRIBUTION
AND ZOOGEOGRAPHIC CONSIDERATIONS**

It is interesting that there is a member of the continental genus *Paratrytone* on Hispaniola, and the absence of other members on Jamaica and especially Cuba is intriguing. It is evident that *batesi* was derived from the *polyclea* branch of the genus, a montane Mexican and Central American complex. The problem, then, is how and when did the progenitor of *batesi* arrive in Hispaniola "without leaving a trail"? Several possibilities are evident, two of which seem quite reasonable. The ancestral stock of *batesi* may have arrived in Hispaniola "the hard way", that is, this hypothetical insect was blown across the Caribbean from Central America and settled substantially where it is today. The other plausible explanation is that the *batesi* progenitor migrated to Hispaniola from Mexico by way of Cuba, and the Cuban



Figs. 19-27: ♀ genitalia of *Choranthus* and its relatives. 19. *Paratrytone batesi* (Bell), paratype. 20. *Paratrytone rhexenor* Godman. 21. *Choranthus richmondi*, new species, holotype. 22. *C. radians* (Lucas). 23. *C. haitensis* Skinner, paratype. 24. *C. vitellius* (Fabricius). 25. *C. borincona* (Watson). 26. *C. lilliae* Bell. 27. *Parachoranthus magdalia* (Herrich-Schaffer).

insects were subsequently exterminated, possibly during the Pleistocene. These, then, are the two most reasonable answers to the question of how this species became established where it is today; now we must ascertain, if possible, when this occurred.

The *polyclea* group of *Paratrytone* from whence *batesi* arose is a tightly-knit group of skippers replacing one another on various mountain ranges of the continent. Nevertheless, all of these species retain very similar superficial, as well as genitalic, characteristics. Whereas genitally *batesi* is clearly a member of this complex, superficially it resembles no other *Paratrytone*; in short, it is the most aberrant member of the genus. This fact, all other things being equal, suggests either a higher evolutionary rate or long isolation. A higher evolutionary rate is generally associated with a small population, whereas a lower rate indicates a larger gene pool. If collection data are at all valid for determining the relative abundance of insects, and they are admittedly poor guidelines, it would appear that the population of *batesi* is no smaller than that of other *polyclea* group skippers; in fact, it is much larger than the apparent populations of other members; there being fewer than ten known specimens of *aphractoia*, and to my knowledge the type of *polyclea* is unique. *Batesi* was described from a series of twenty-one specimens. While these data indicate that the population of *batesi* is at least as high as that of almost any other member of the genus, they are not in themselves proof of this contention. The area occupied by *batesi* is as large or larger than the known ranges of several of the other species (*aphractoia* is known from Popocatepetl, Mexico, only), and assuming comparable population densities, the Hispaniolan insect should have a relatively large population. All members of the *polyclea* complex, including *batesi*, are cool-tolerant species which at first glance could indicate dispersal and differentiation solely within the Pleistocene. A glance, however, at some of the closely related hesperiids which undoubtedly have separated during the Pleistocene in temperate North America (such as *Poanes hobomok* and *taxiles*) shows that such species have diverged far less than have members of the *polyclea* complex, and particularly *batesi* from the other members. While the Pleistocene has been a potent force in the evolution, isolation and imposition of conditions upon these insects, it seems inescapable that these species, particularly *batesi*, were at least somewhat distinct before the advent of the Pleistocene cooling. I assume that *batesi*'s progenitor arrived on Hispaniola sometime during the Tertiary, as suggested for the ithomiids by Fox (1963).

Parachoranthus magdalia is a species which appears to have done little moving since it arrived in the Antilles. It is apparently abundant in eastern Cuba, but it has not been reported elsewhere. There are similarities between this butterfly and members of both the *Poanes* and *Polites* complexes, both of which have proliferated on the mainland. The intermediate position held by *Parachoranthus* indicates its arrival in the West Indies preceded the separation of the *Poanes* and *Polites* complexes on the mainland. This suggests great antiquity for the Cuban insect, and many of the arguments put forth for *batesi* above also apply here; perhaps *Parachoranthus* is as old as any of the present-day Antillean butterflies.

A very interesting pattern of distribution is found in the genus *Choranthus*, s. s. In the *radians* complex, the one systematically furthest removed from continental *Poanes*, a linear relationship exists with the Bahaman *richmondi* closest to the Cuban *radians*, which in turn is the closest relative of the Hispaniolan *haitensis*, the closest (though in this case not very close) relative of the Puerto Rican *vitellius*. This pattern is compatible with most theories of distribution throughout the Antilles: species found in the western Bahamas should logically have been derived from Cuban stocks, and the main route of dispersal of organisms into Puerto Rico is *via* Hispanola, whether directly from there or ultimately from Cuba. Furthermore, the systematic proximity of these four species indicates that at least some of them are recent migrants to the areas they now inhabit. This is particularly true of *richmondi*, and it is entirely possible that *richmondi* arrived in the Bahamas and differentiated during or after the Pleistocene, a pattern often cited by Clench (1964). *Vitellius*, the most aberrant member of the *radians* complex, is a less likely Pleistocene immigrant; it probably arrived and at least partially differentiated in the late Tertiary, completing its differentiation as we now see it *in situ* during the Pleistocene. The relationship of *radians* and *haitensis* is very close (certainly one was derived from the other), and the definitive separation probably took place during the Pleistocene. It is difficult to ascertain whether Cuba or Hispaniola was the center of the *radians* group — either as the center could account for the present-day distribution of the complex.

Finally we must consider the *lilliae* group of *Choranthus*. This group is represented at low to moderate elevations in both Jamaica (*lilliae*) and Puerto Rico (*borincona*), but the group is strangely absent from Hispaniola. Despite the lack of present-

day members on Hispaniola (the island is poorly collected, and one may yet be found there), the logical pattern of distribution of the *lilliae* group centers on that island. Jamaica is an "eddy" in the mainstream of trans-Antillean migration and can hardly be considered the center of any complex. The same may be said of Puerto Rico, though it occupies an end in the distributional chain, as indicated in the discussion of the *radians* group. Therefore, it is necessary to search for an undiscovered or extinct Cuban and/or Hispaniolan ancestor of the *lilliae* group skippers. The existence of an insect in Hispaniola alone is easier to justify than that of not only the Hispaniolan skipper, but also a Cuban one, so Hispaniola looks more like the logical center of the dispersal of the present group. The two species in question are the most aberrant members of the genus *Choranthus*; indeed, it was tempting to erect a new genus for them. The differences cited are of a fundamental nature involving conservative characters, and the conclusion seems inescapable that this divergence required BOTH isolation and time. The two species in the present group certainly diverged early from the stock which produced the *radians* group, and at least the two complexes seem to have been distinct before the advent of the Pleistocene cooling. The stocks on Jamaica and Puerto Rico were almost certainly there before the Pleistocene and remained there, perhaps becoming full species only then. Pleistocene cooling, furthermore, may have been responsible for the extermination of the Hispaniolan stock of the *lilliae* group, if, indeed, it is extinct.

With the exception of *Parachoranthus* mentioned earlier, it appears that the distribution of *Choranthus* and its allies was centered in Hispaniola. Perhaps it was there that the genus *Choranthus* evolved into the two basic groups, and it seems likely that several species had partially or completely differentiated by the Pleistocene, thus paralleling the situation postulated for the Ithomiidae by Fox (1963). The present distribution of *Parachoranthus magdalia* and the probable source of *Choranthus richmondi* strongly supports the existence of a southeastern Cuban Pleistocene refugium mentioned by Clench (1964: 257-265). His postulated wholesale Quaternary extermination of the butterfly fauna of Puerto Rico and the subsequent recolonization by Hispaniolan stocks is not supported by the evidence in *Choranthus*; there are two endemic Puerto Rican species, more than on any other island, and these are very distinct from their relatives, more so than are the Cuban or Hispaniolan representatives. It is therefore necessary to assume that these species survived

the Pleistocene *in situ* and were not Pleistocene or post-Pleistocene immigrants from Hispaniola. In fairness, I point out that Clench (in litt.) has said, "I agree that your two *Choranthus* survived at least one glaciation in Puerto Rico . . . Any species that could tolerate the cooling could have. Such species today need not be exclusively montane, but they should occur up into montane conditions (*i. e.*, *ca.* 2000 feet +)." I remain unconvinced, however, that one glaciation is sufficient to produce the differentiation shown by the Puerto Rican *Choranthus*.

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